Self-Determination Interventions’ Effects on the Academic Performance of Students with Developmental Disabilities

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Abstract: Federal laws mandate that students with cognitive disabilities receive instruction in academic skills and also support the importance of teaching self-determination. The purpose of this literature review was to synthesize intervention research examining effects of self-determination interventions on academic skills for students with cognitive disabilities. Findings indicated that the majority of self-determination interventions affected skills that directly support academic performance (e.g., organization of academic assignments); however, traditional academic skills such as math productivity and spelling accuracy were also positively affected. The review included analysis of the strength of results, research design quality, and discussion of implications for researchers and practitioners.

Outcomes for students with mental retardation represent some of the poorest postschool outcomes of any disability group, including being the least likely to (a) leave high school with a diploma, (b) be involved in organized community groups, and (c) be engaged in work, postsecondary education, or work preparation (National Longitudinal Transition Study 2 [NLTS2], 2005). However, this population of students is the most likely disability group to be living on their own and parenting two years out of high school (NLTS2).

One factor that has been associated with positive outcomes for school leavers with mental retardation is self-determination. Wehmeyer and Schwartz (1998) noted a correlation between level of self-determination for adults with cognitive disabilities, as measured on a normed scale, and quality of life, measured on a questionnaire. Wehmeyer and Schwartz (1997) also demonstrated a correlation between high levels of self-determination and financial autonomy as demonstrated by maintenance of a checking or savings account, employment (full or part-time), and wages earned. Wehmeyer and Palmer (2003) extended these results for the same group of participants in a follow-up study and found a positive relationship between self-determination and work-related benefits earned, such as vacation and sick leave.

There have been several literature reviews measuring the effects of self-determination interventions for students with disabilities, including students with mental retardation or developmental disabilities. First, Harchik, Sherman, and Sheldon (1992) reviewed the effects of various self-management interventions including self-evaluation, self-regulation, and self-instruction on various behaviors (e.g., on-task, disruptive, social skills, in seat, work rate) of individuals with developmental disabilities. Authors concluded that most often these interventions were combined with other procedures such as token motivational systems or prompts. However, they found that when “self” managed interventions were compared to “other” managed interventions, the “self” interventions were more effective (Harchik et al.). Second, Algozzine, Browder, Karvonen, Test, & Wood (2001) conducted a meta-analysis of self-determination interventions across
all disability groups and ages and determined that students with mental retardation were most frequently taught choice-making skills. Goal-setting in conjunction with other instructional strategies was determined to be effective for improving task performance in Copeland and Hughes’ (2002) review of goal-setting interventions with individuals with mental retardation. Next, Shogren, Fagella-Luby, Bae, and Wehmeyer (2004) conducted a meta-analysis of choice interventions within academic, daily living, and vocational activities for individuals with developmental disabilities and found questionable results across the studies. Finally, Test, Fowler, Brewer, and Wood (2005) examined the effects of self-advocacy interventions across disability categories and determined that students with mental retardation were most frequently taught self-awareness and assertive communication skills in an effort to improve their participation in their IEP meetings.

The majority of studies examined in these literature reviews investigated self-determination intervention effects on behaviors related to classroom success such as “on-task behavior” (e.g., Copeland & Hughes, 2002; Harchik et al., 1992), aggressive behavior (e.g., Shogren et al., 2004), assertive communication skills (e.g., Test et al., 2005), or specific self-determination behaviors such as participation in IEP meetings (e.g., Test et al.). Although some of these literature reviews included studies that measured academic dependent variables, none looked exclusively at effects of self-determination interventions on academic outcomes.

In addition to having self-determination skills, another predictor of postschool success for students with disabilities is academic performance in such areas as reading, writing, and math (Benz, Yovanoff, & Doren, 1997). Benz et al. and Raskind, Goldberg, Higgins, and Herman (1999) correlated school factors and postschool success for students with disabilities. Raskind et al. concluded that higher levels of education attained and reading and math achievement were among predictors of post-school success for students with disabilities. In a post-school survey of students with and without disabilities, Benz concluded that the level of reading, writing, math, and problem-solving skills students had at the time they exited school were each significantly correlated with being competitively employed. These findings underscore the importance of academic achievement for all students.

While students with mental retardation and other developmental disabilities have most frequently been excluded from academic instruction and access to the curriculum experienced by their peers without disabilities (NLTS2, 2003), the emphasis on academic skill instruction for all students, including those with mental retardation and developmental disabilities (MRDD), is increasing in light of legal mandates for access to the general curriculum (IDEA, 2004) and participation by all students in the state and district assessment process (NCLB, 2001). In addition, strong academic skills appear to contribute to post-school success (Benz et al., 1997; Raskind et al., 1999).

Wehmeyer, Field, Doren, Jones, and Mason (2004) analyzed this push for students to engage in the general curriculum and concluded that self-determination skills can be taught within the current educational framework. The results of the Agran, Blanchard, Wehmeyer, and Hughes (2002) study designed to investigate the effects of self-regulated problem-solving instruction on specific classroom behaviors demonstrated that self-determination can be used as a mechanism for increasing access to the general curriculum by students with disabilities. The authors concluded that students with MRDD can be taught to problem-solve and self-manage their performance within academic content areas. Thus infusing self-determination skills into the general curriculum can be one method to overcome the finding of Wehmeyer, Agron, and Hughes’ (2000) national survey of special education teachers that teachers did not have enough time to teach self-determination skills, due to the need to focus instruction on other skills.

As a result, teachers may need tools that help them accomplish teaching both academic and self-determination skills simultaneously. Specifically, there is a need for examples of research-based strategies designed to combine self-determination and academic instruction for students with MRDD. Therefore, the purpose of this review was to identify, describe, and synthesize studies that have ex-
examined the effects of self-determination interventions on the academic skills of students with mental retardation and developmental disabilities.

**Method**

**Selection Procedures**

Studies were identified for this literature review through a four-step process. First, authors conducted a computer search of the ERIC database using full and truncated versions of the following terms: student, child, self determination, self monitoring, choice making, problem solving, goal setting, decision making, self regulation, self advocacy, self understanding, self awareness, self efficacy, self directed, self instruction, self evaluation, student involvement, reading, mathematics, writing, written expression, science, social studies, behavior, general education, general curriculum, social skills, special education, and disabilities. Second, authors completed a hand search for the years 2000–2005 of 10 major special education journals: Behavioral Disorders, Career Development for Exceptional Individuals, Education and Training in Developmental Disabilities, Exceptional Children, Journal of Applied Behavior Analysis, Journal of Positive Behavior Interventions, Journal of Special Education, Learning Disability Quarterly, Learning Disabilities Research and Practice, and Remedial and Special Education. Third an additional electronic search was conducted to add the terms intervention package for which a component self-advocacy during the hand search. Finally, we examined reference lists from literature reviews on self-determination (i.e., Algozzine et al., 2001), self-recruitment (i.e., Alber & Heward, 2000), goal-setting (i.e., Copeland & Hughes, 2002), self-management (i.e., Shogren et al., 2004) and self-advocacy (i.e., Test et al., 2005).

To be included in our review, studies needed to meet the following criteria. The criteria included articles (a) published through May 2005 in peer-reviewed journals, (b) that included at least one student participant (pre-K through post-secondary education) with an identified disability, as defined by IDEA (2004) or a diagnosis of ADHD, (c) in which the intervention and data collection took place in a school setting, including college or university settings, (d) in which the independent variable taught a self-determination skill, (e) that measured at least one dependent variable that was an academic skill, and (f) that were experimental (e.g., single-subject or group experimental), pre-experimental (e.g., pretest-posttest), or qualitative analyses of an intervention.

With regard to the independent variables of included studies, a self-determination intervention included one or more of the following skills: choice making, decision making, problem solving, goal setting and attainment, self-advocacy, self-awareness, self-management, or self-efficacy (Algozzine et al., 2001; Wehmeyer, 1999). Self-determination had to be the primary component or a portion of an intervention package for which a component analysis allowed for observation of the incremental effects of the self-determination intervention.

For dependent variables, academic skills were defined as tasks within any course or subject area that involved academic skills such as reading, writing, math, or spelling. For example, a student’s ability to read the labels of parts in an automotive maintenance course was considered an academic task; however, a student’s ability to assemble pens in a vocational preparation class that did not require reading, counting, or writing was not. Academic skills were noted as measures of: (a) quality, defined as accuracy and/or fluency on an academic task or as indicated by a holistic score or rating on a quality checklist; (b) productivity, defined as amount of task completed; (c) standardized academic assessment performance; and/or (d) other (e.g., asking for help on an academic task, following instructions to complete an academic task, organizational skills directly associated with completing an academic task). See Table 1 for detailed explanations of each study’s academic dependent variable(s).

While behaviors such as “on-task” may affect classroom performance, in this literature review we chose only to include studies that measured behaviors directly related to academic performance. We chose to narrow our focus for two reasons. First, much of the self-determination literature to date for students with mental retardation has focused on social behavior (e.g., Harchik et al.,
1992) or non-academic skill performance (e.g., Copeland & Hughes, 2002). Second, teachers are expected to teach academic skills as well as self-determination skills to students with disabilities (Wehmeyer et al., 2004). Narrowing the focus was consistent with the purpose of our review; an attempt to locate examples of evidence-based strategies that teach both.

**Scope of Review**

Fifty-eight studies were identified that met the inclusion criteria. Due to the large number of studies identified, findings were divided into disability categories. Fourteen studies included participants with MRDD; however, for three studies the results were not reported in a manner to determine which participants were labeled MRDD (i.e., Anderson-Inman, Paine, Deutchman, 1984; Palmer & Wehmeyer, 2003; Taylor-Ritzler, Balcazar, Keys, Hayes, Garate-Serafini, & Espino, 2001). Therefore, these three studies were excluded from this review. This review summarizes the findings from the 11 studies that clearly delineated intervention effects for the target population.

**Procedures for Descriptive Review**

For each study a researcher-developed coding form was used to gather information on age, disability, and ethnicity of participants; setting; research design; dependent variables; independent variables; and results. Inter-rater reliability for this information was calculated in two stages. The first two authors read titles and abstracts of the 191 articles identified in the initial computer search and decided independently whether or not the articles should be included. They agreed on the inclusion of 91.6% of articles before proceeding to the individual review stage. All disagreements were discussed and agreement was reached. As a result, 58 studies met the inclusion criteria and 11 were identified that analyzed results specifically for students with MRDD.

Next, inter-rater agreement was calculated for the descriptive information gathered from 4 (36.4%) of the 11 MRDD articles by two of the authors. Inter-rater agreement was calculated by dividing the total number of agreements by the total number of items reviewed and converted to a percentage. Consensus was reached on disagreements before information was recorded as results. Inter-rater reliability for this portion of the review ranged from 92.4% to 95.7% with a mean of 94.4%.

**Procedures for Evaluation of Study Quality**

Quality indicators for group designs described by Gersten et al. (2005) and for single subject designs described by Horner et al. (2005) were used to analyze the research quality of each study. Gersten et al. (2005) delineated 10 essential quality indicators for group and quasi-experimental research and Horner et al. (2005) identified 21 for single-subject research. Two authors independently reviewed four (36.4%) of the studies using forms based on Horner et al. (2005), since the vast majority of studies (n = 10) used single-subject designs. The same methods for calculating reliability were used as described previously. Reliability ranged from 76.0 to 100% with a mean of 86.0%.

**Calculation of Intervention Effects**

Gersten et al. (2005) noted the importance of reporting the power of an intervention, because it indicates the probability of an accurately analyzed statistically significant result. In single-subject research, systematically analyzing the effects of an intervention is critical to understanding its external validity (Scruggs, Mastropieri, & Casto, 1987). Several methods have been used to assess the strength of the results of single-subject studies (Campbell, 2003; Scruggs et al.; Scruggs & Mastropieri, 2001) and effect sizes are a frequently used power analysis in group experiments (Gersten et al.). This review reports the strength of the effects on the academic variables for the studies that used single subject designs and reported data in a manner that allowed for such calculations; however, the one group design study did not provide information to allow calculations of an effect size.

Based on the single-subject meta-analysis works of Scruggs and Mastropieri (2001), Scruggs et al. (1987), and Algozzine et al. (2001), we decided to use percentage of non-overlapping data points (PND) to analyze the
TABLE 1

Study Methods

<table>
<thead>
<tr>
<th>Reference</th>
<th>Independent Variable</th>
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<tbody>
<tr>
<td>Brooks, Todd, Tofflemoyer, &amp; Horner (2003)</td>
<td>Self-management: Intervention determined through results of functional behavior assessment and resulting behavior support plan; taught (1) discrimination of on-task behavior through examples and nonexamples of on-task seat work and on-task group work; (2) operation of a cassette player using task analysis; (3) self-monitoring of on-task behavior instruction: (a) use of picture cue of tape player on student’s schedule, (b) record a + or − on card for on-task when tape prompts “now”; and (4) self-recruitment of praise with prompt of hand icon at every 6th checkpoint; received praise for accurate recording; earned activity with peer for on-task behavior; 12 30-minute instructional sessions.</td>
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<td>Hughes, Copeland, Agran, Wehmeyer, Rodi, &amp; Presley (2002)</td>
<td>Self-management: Students provided with (1) rationale for self-monitoring; (2) modeling, direct instruction, guided practice, corrective feedback on self-monitoring procedures; students were taught to place a check on self-monitoring form for (a) “find picture,” (b) “find picture caption,” (c) write name of tool after performing each task on a modified worksheet in auto-mechanics class; 2–3 training sessions.</td>
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<td>O’Reilly, Lacioni, Gardiner, Tiernan, &amp; Lacy (2002)</td>
<td>Decision making, problem-solving, self-management: Training scripts were modeled and role-played with verbalization of steps (self-instruction) to teach student to (1) decide the situation to determine the problem, (2) decide what to do to resolve the problem, (3) perform behavior, and (4) self-evaluate the effectiveness of the performed behavior; 40-minute sessions using 4–5 social situations; 1 session/day.</td>
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<tr>
<td>Agran, Blanchard, Wehmeyer, &amp; Hughes (2001)</td>
<td>Problem-solving, goal-setting, self-management: Students learned to set a goal, monitor performance, evaluate the outcome, and provide self-reinforcement for desired responding; students received problem-solving instruction based on SDLMI that involved three instructional phases: setting a goal, taking action, adjusting goal or plan; included verbal instruction, modeling, guided practice, independent performance, and review.</td>
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<td>Agran, Blanchard, &amp; Wehmeyer (2000)</td>
<td>Goal-setting, self-management: Students (a) selected transition-related goals to work on, (b) learned to use problem-solving strategies to answer questions that would help them create and implement action plan, (c) implemented action plan, and (d) self-evaluated progress in achieving their goals.</td>
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</table>

The strength of the effects of single-subject interventions. Data were reported in a manner that allowed for calculation of PND for individuals identified as MRDD in seven (64%) of the
For these studies, PNDs were calculated as follows. First, the most extreme (highest for targeting high performance and lowest for targeting low performance) data point in the baseline phase was noted. Second, all points in the intervention phase that exceeded that point were counted and divided by the total number of points in the intervention phase (Scruggs et al.). This number was converted to a percentage and reported as the PND.

In reversal designs, phases with self-determination interventions were compared to all phases without self-determination (e.g., Moes, 1998). For studies using a multiple baseline design, we only calculated percentage of non-overlapping data points for students, skills, or settings in which an academic dependent variable was measured. For example, in a study that used a multiple baseline across students, the dependent variable may not have been an academic skill for all participants (e.g., Hughes et al., 2002). In those cases, we only counted data points in the academic tiers. Similarly, percentage of non-overlapping data points could only be calculated when the academic variable was graphed, rather than described in the results as a secondary or tertiary variable.

### Table 1—(Continued)

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<tr>
<th>Reference</th>
<th>Independent Variable</th>
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<td>Craft, Alber, &amp; Heward (1998)</td>
<td><strong>Self-advocacy:</strong> One-on-one self-recruitment training; included three parts: (a) instruction and role play, (b) morning prompts, and (c) end-of-day check and reward; instruction included discussion of rationale, modeling, &quot;think aloud&quot; procedures, and role-playing with feedback; 20-minute sessions; 2 sessions.</td>
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<td></td>
<td>1. Percentage of items completed on spelling assignment</td>
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<td></td>
<td>[Productivity on language arts assignments]</td>
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<td></td>
<td>2. Percentage of items correct on spelling assignment</td>
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<td></td>
<td>[Quality of language arts assignments]</td>
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<td>Moes (1998)</td>
<td><strong>Choice-making:</strong> Two conditions—(1) no choice: tutor chose order of homework activities, sequence of problems, and stimulus items (e.g., pens, scissors); (2) choice: child chose order of homework activities, sequence of problems, and stimulus items.</td>
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<tr>
<td></td>
<td>[Quality of homework assignments]</td>
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<td></td>
<td>2. Number of homework trials (i.e., instances of child output on homework sheets that were legible and consistent with instructions) completed per minute</td>
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<td>[Productivity on homework assignments]</td>
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<td>McCarl, Svobodny, &amp; Beare (1991)</td>
<td><strong>Self-management:</strong> Students taught during 20–30 minute sessions for 4 days: (1) rationale for target behavior discussed, (2) demonstration of examples and non examples of on task behavior, (3) participants discriminate between on and off task behaviors observed, (4) role play of on and off task behaviors, (5) evaluation of participant understanding of target behavior; participants self-assessed behavior during independent work and self-recorded “Y” or “N” when prompted through audio tape every 10–120 s.</td>
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<tr>
<td></td>
<td>[Productivity on math assignments]</td>
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<td></td>
<td>2. Percent correct of math problems completed during independent seatwork</td>
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<td></td>
<td>[Quality of math assignments]</td>
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<td>Warner &amp; deJung (1971)</td>
<td><strong>Goal-setting:</strong> Under goal setting condition, participants were instructed to identify the number of words they thought they could get correct from a list of 10 words: (a) each participant recorded responses, (b) participant given 15 seconds after the experimenter’s second verbal reading of the word to respond, (c) verbal praise given for correct response, no verbal expression given for incorrect response.</td>
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<tr>
<td></td>
<td>[Quality of language arts assignments]</td>
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</tbody>
</table>
variable. PND was only calculated for studies using an alternating treatment design, if a baseline measure was included.

For multiple baselines across students that measured the same skill, non overlapping data points were added across phases and were divided by the total number of intervention points across phases to determine PND for that variable. However, if more than one academic dependent variable was measured (e.g., math and reading), PNDs were calculated and reported for each dependent variable.

Median PNDs were calculated across the seven single-subject studies for which data were calculated for all academic dependent variables. In addition, median PNDs were calculated for specific self-determination components and specific academic dependent variables. Scruggs and Mastropieri (2001) noted that a PND from 70 – 90% can be interpreted as an effective intervention, 50-70% as questionable, and below 50% as ineffective.

Results

Student Demographic Information

One hundred fifty-six participants with MRDD were included in the 11 studies, with a range of 1 to 80 participants. Three studies (27.2%) included students from other disability populations or students without disabilities (i.e., Agran, Blanchard, Wehmeyer, & Hughes, 2001; Agran, Blanchard, & Wehmeyer, 2000; Rock, 2005). Participants with MRDD represented 21 (61.8%) of the 34 participants in these studies with disability and non-disability populations. All studies reported data on gender. Male participants numbered 104 (66.7%) and 52 (33.3%) were female. Only two (18.2%) studies reported data on the ethnicity of participants (i.e., Hughes et al., 2002; Rock; Warner & deJung, 1971). For these two studies 50% of participants were identified as White and 50% as African-American.

Setting

Seven (63.6%) took place in general education classrooms at the elementary, middle, and high school levels (i.e., Agran et al., 2000, 2001, 2002; Brooks, Todd, Tofflemoyer, & Horner, 2003; Craft, Alber, & Heward, 1998; Hughes et al., 2002; Rock, 2005), five (45.5%) were in resource or self-contained special education classrooms at various grade levels (i.e., Brooks et al.; Craft et al.; Hughes et al.; McCarl, Svobodny, & Beare, 1991; O’Reilly, Lancia, Gardner, Tiernan, & Lacy, 2002), and three (27.3%) occurred in non-specific locations in public schools (i.e., Hughes et al.; Rock; Warner & deJung, 1971). Finally, two (18.2%) studies were conducted in clinic and non-integrated settings for individuals with disabilities (i.e., Moes, 1998; Warner & deJung, 1971), and one (9.1%) took place in a community work site (i.e., Agran et al., 2000).

Academic Variables Measured

Eighteen academic variables were measured across the 11 studies. This represents just less than half (45%) of all the dependent variables (academic and non-academic) measured in the studies in this review. Quality (accuracy or fluency) of various language arts assignments was measured in four (36.4%) studies (e.g., Hughes et al., 2002; Warner & deJung, 1971). While quality of math assignments, productivity in math assignments, and productivity of general assignments were each measured in two (18.2%) studies. Productivity on language arts assignments (i.e., Craft et al., 1998) and general assignment quality (i.e., Moes, 1998) were each measured in one (9.1%) study. Finally, other measures of academic performance that were not direct measures of accuracy or productivity in a reading, writing, or math task (e.g., Agran et al., 2002; O’Reilly et al., 2002) were measured in three (27.3%) studies, and represented six (33.3%) of the academic variables measured in the review.

Language arts dependent variables. Hughes et al. (2002) measured the accuracy of writing the labels for parts in an auto-mechanics
course, which was categorized as a quality measure on a language arts assignment. Accuracy of an alphabetizing assignment (Agran et al., 2000) and Warner and deJung’s (1971) accuracy on spelling assignments, were also placed in this category of dependent variables. One study (Craft et al., 1998) measured the percentage of items completed on a spelling assignment, after providing self-recruitment training to students.

Math dependent variables. Rock (2005) measured the accuracy and productivity of student independent math work with a computer software tool that generated unlimited practice assignments, individualized for each student. Two of the nine students in the study were diagnosed with developmental disabilities. McCarl et al. (1991) measured accuracy of math seatwork and calculated the number of digits written in completing math seatwork for three elementary age students diagnosed with mild and moderate mental retardation. Neither study specified the specific math operations completed by students in the study.

General academic measures. General measures of productivity included both homework (Moes, 1998) and seatwork (Brooks et al., 2003) assignment completion rates in math and language arts subject areas. General academic accuracy measures also included both accuracy on homework assignments (Moes) and accuracy on seatwork assignments (Brooks et al.).

Other dependent variables. Measures categorized as “other” for this review included the Goal Attainment Scaling applied to measuring academic goals met (e.g., Agran et al., 2002). Three studies (27.3%) examined students’ use of organizational and communication skills directly linked to academic performance including following directions to complete assignments (e.g., O’Reilly et al., 2002), organizational skills for assignment completion (Agran et al., 2001), and verbal contributions to class (Agran et al., 2002).

Self-Determination Interventions and Results

Self-management interventions were used in four (36.4%) studies. Choice-making, goal setting, and self-advocacy were the primary self-determination components of the intervention for one (9.1%) study each. Four (36.4%) studies implemented self-determination interventions using multiple component skills.

Self-management interventions. Four studies used self-management as their primary independent variable. First, McCarl et al. (1991) used tape recorded auditory prompts to teach students to self-monitor their on-task behaviors to improve academic accuracy and productivity. Hughes et al. (2002) taught students to use a checklist to self-monitor accuracy of assignment completion. Brooks et al. (2003) used auditory prompts to teach self-monitoring of on-task behaviors, accuracy, and productivity. Rock (2005) taught students a 6-step strategy for self-recording attention to task and performance using auditory prompts to increase student accuracy and productivity on math problems completed. Self-management interventions, which included self-recording attention to task or on-task behavior (e.g. McCarl et al., 1991), self-recording productivity on assignments (e.g., Rock), and use of a self-monitoring checklist (e.g. Hughes et al.), were used to increase (a) productivity on math assignments, (b) accuracy on language arts assignments, and (c) productivity on general class assignments. Self-management interventions also (a) decreased off-task behavior, (b) increased on-task behaviors, (c) increased accuracy on non-academic behaviors, and (d) improved self-monitoring skills.

Choice-making intervention. One study used choice-making as their independent variable. Moes (1998) provided students with autism with choices regarding the order in which assignments were to be completed. The intervention increased student productivity and accuracy on homework assignments, decreased disruptive behaviors, and improved the affect of participants in the intervention.

Goal setting intervention. Students were instructed to identify a goal regarding the number of spelling words they might get correct in the one study that used goal-setting alone as intervention to promote academic performance (Warner & deJung, 1971). The intervention increased student productivity and accuracy on homework assignments, decreased disruptive behaviors, and improved the effect of participants in the intervention.

Self-advocacy intervention. Role play, direct instruction, and beginning and end-of-day monitoring by instructors were used to teach students to self-recruit teacher assistance to improve spelling assignment accuracy and
productivity (Craft et al., 1998). The intervention increased student productivity and accuracy on class assignments and increased the frequency of self-recruiting for assistance and of teacher praise for the student.

**Multi-component interventions.** Of the four studies that used a multi-component approach to promoting students’ academic skills, three (75%) used the *Self-Determined Learning Model of Instruction* to guide students through a three step process of (a) setting a goal by identifying their strengths and needs (self-awareness) and engaging in choice-making; (b) creating a plan to meet the goal which may include decision-making, problem-solving, and self-advocacy; and (c) adjusting the plan based on self-evaluation of progress, problem-solving barriers, and self-monitoring steps toward the goal. In addition, O’Reilly et al. (2002) used role play and student self-instruction/self-verbalization of steps to move one student through a decision-making and problem-solving process to increase the student’s ability to follow directions to complete academic assignments. Multi-component interventions yielded positive results on (a) organizational skills to complete assignments (e.g., Agran et al., 2001), (b) asking for teacher assistance on academic assignments (e.g., Agran et al., 2002; O’Reilly), (c) following instructions on assignments (e.g., Agran et al., 2002; O’Reilly), and (d) accuracy on a language arts assignment (i.e., Agran et al., 2000). Multi-component interventions also demonstrated positive effects on non-academic goals such as social, daily living, or employment goal attainment in the three studies using the *Self-Determined Learning Model of Instruction* (i.e., Agran et al., 2000, 2001, 2002).

**Additional results.** Maintenance data were collected for five (45.5%) studies (Agran et al., 2001, 2002, 2000; Craft et al., 1998; Hughes et al., 2002). Studies demonstrated generally positive results on the academic variable for 2 to 24 days after intervention. Four (36.4%) studies also collected generalization data. Generalization data were positive for three (75%) of these studies (i.e., Agran et al., 2002; Craft et al.; Hughes et al.). Finally, social validity measures were gathered in five (45.5%) studies (e.g., Agran et al., 2002; Moes, 1998). All social validity data were positive, noting the value of the intervention, the impact on student skills, or the practicality of the intervention.

**Percent Non-Overlapping Data Points**

The PNDs of the academic dependent variable were able to be calculated for seven (63.6%) of the 11 studies and results and strengths of effects are summarized in Table 2. PNDs could not be calculated for four (36.4%) studies because (a) data were not graphed for the academic variable (Rock, 2005), (b) graphed results could not be clearly associated with the participants with MRDD, but results were described narratively for the population (i.e., Agran, et al., 2000; Agran et al., 2001), or (c) the study used a group design and effect sizes could not be calculated with the data provided (Warner & deJung, 1971). PNDs for four (57.2%) of the seven studies were above 90%, indicating very strong results. Three of these studies demonstrated 100% non-overlapping data points between the phase of the study without the self-determination intervention and the use of the self-determination on the academic variable measured (Agran et al., 2002; Hughes et al., 2002; O’Reilly et al., 2002). In addition, Moes (1998) and McCarl et al. (1991) demonstrated PNDs above 70%, whereas Craft et al. (1998) demonstrated poor results below 25%. The median PND across the seven studies was 85%, indicating strong effects (Scruggs & Mastropieri, 2001).

**PNDs for dependent variables.** We calculated the median PND across studies within categories of dependent variables to get a sense of the strengths of interventions in these academic areas. The median PND for measures of other academic skills, including assignment organization skills, was 100%. For general measures of academic productivity, median PND was 86%, while general measures of academic accuracy had a median PND of 85%. Math assignment productivity measures yielded a PND of 74%, while language arts assignment productivity yielded a PND of 21%. Finally, language arts quality yielded a median PND of 50% and math quality a PND of 11%.

**PNDs for independent variables.** Median PNDs for studies that used particular components of self-determination in the indepen-
dent variable were also calculated. Studies that used self-management interventions yielded a median PND for the academic variable of 84%. The choice-making intervention yielded a median PND of 81% homework assignment accuracy and productivity, while the self-advocacy intervention yielded a median PND of 11% on language arts productivity and quality. The goal-setting intervention that was used in the one group design study did not report data in a manner that allowed for calculation of effect sizes. Median PNDs for studies that used multiple components of self-determination in the intervention were 100%.

Quality Indicators

The quality indicators from Horner et al.’s (2005) and Gersten et al.’s (2005) descriptions of quality research in special education addressed by each study are described below.

Single subject designs. A condensed list of single-subject quality indicators is provided in Table 3. For example if a study’s “dependent variables are described with operational precision . . . (are) measured with a procedure that generates a quantifiable index . . . measurement . . . (are) valid and described with replicable precision . . . dependent variables were measured repeatedly over time” (Horner et al., 2005, p.174), the study is reported to have a “dependent variable that is operationally defined”. Similarly, if a study met indicators for social validity, including the “dependent variable is socially important . . . magnitude of change in the dependent variable . . . is socially important . . . implementation . . . is practical and cost effective” (Horner et al., p.174), the study was reported to have a “socially valid intervention.” A full description of quality indicators can be obtained from the first author.

Ten (100%) of the single-subject studies described the participants and setting for the intervention thoroughly. While all studies included gender information, only two (20.0%) studies included data on participants’ ethnicity. Five (50.0%) also described how participants were selected in a manner that would allow for replication.

The dependent variable was defined so that it could be quantified and measured and interobserver agreement was measured and above 80% in all single-subject studies. All studies also described the independent variable clearly, including a clear description of baseline and treatment conditions. However, procedural fidelity was measured in only one (10.0%) of the 10 studies (O’Reilly et al., 2002). The baseline phase demonstrated a stable pattern of behavior in eight (80.0%) instances. Seven (70.0%) studies also provided three replications of effect of the independent variable on the dependent variable through multiple baseline designs across three or more participants (e.g. Hughes et al., 2002) or through a reversal design with three demonstrations of effect (Moes, 1998). In one of the three studies that did not demonstrate three replications of effect, the study was a two-tiered multiple baseline design across settings (O’Reilly et al., 2002). All studies had interventions that were socially valid based on the social importance of the dependent variable, as well as the practicality of implementation and cost of the intervention.

Group designs. The one group intervention study provided a compelling rationale for its research and clearly articulated the purpose of the study. It also clearly described the participants in the study, but did not provide information on ethnicity of participants. Warner and deJung (1971) used an experimental design, and researchers took steps to ensure the equivalency of the groups. The intervention was clearly described for replication; however, procedural fidelity data were not collected. Methods of data analysis corresponded to the research questions and data gathered. Effect sizes were not reported in the analysis, nor were data provided amenable to calculation of effect sizes for the current review.

Discussion

The purpose of this review of literature was to describe studies that have examined the effects of self-determination interventions on the academic skills of students with mental retardation and other developmental disabilities. While the results summarized may not provide definitive instructions for practitioners, it is a solid beginning and provides the field with a direction for future research and suggestions for practice.
TABLE 2

Strength of Intervention Effects

<table>
<thead>
<tr>
<th>Reference</th>
<th>Results for Academic Variable</th>
<th>Percent Non-Overlapping Data Points</th>
</tr>
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</table>
| Rock (2005) | 1. Some effect on number of math problems completed each day (i.e., mixed results)  
2. No effect on accuracy of math work | Unable to calculate strength of effects because results for academic dependent variable not graphed |
| Brooks et al. (2003) | 1. Work completion appears to have increased during intervention; however, minimal data collection make results inconclusive  
2. Generalization of skills occurred in one of two generalization settings | 94% PND for completed seatwork assignments w/self-management intervention |
| Agran et al. (2002) | 1. All 4 students demonstrated 100% accuracy on target behaviors, including following directions to complete assignments and contributions to class  
2. All students surpassed expectations on GAS | 100% PND for following directions & 100% PND for frequency of verbal contributions to class w/ SD intervention |
| Hughes et al. (2002) | 1. Student demonstrated correct written responses at 100% accuracy during training | 100% PND for writing correct answer w/ self-management intervention for students with mental retardation |
| O’Reilly et al. (2002) | 1. Increases in appropriate behaviors in both settings | 100% PND for frequency of behaviors w/ SD intervention |
| Agran et al. (2001) | 1. Marked increase in target performance for all students  
2. After changing reinforcer, each group’s data stabilized during the training condition  
3. Positive maintenance results for all three groups | Unable to calculate strength of effects for participants with MRDD due to manner in which data on the academic variable was reported |
| Agran et al. (2000) | 1. Mean performance increased for students with academic target behaviors  
2. Maintenance scores increased for majority of students | Unable to calculate strength of effects for participants with MRDD due to manner in which data on the academic variable was reported |
| Craft et al. (1998) | 1. Increases in completion of academic work  
2. Improved accuracy of academic work | 21% PND for completed spelling tasks w/ self-advocacy intervention 0% PND for accurate spelling items w/ self-advocacy intervention |
| Moes (1998) | 1. Increases in percentage of correct responses in choice condition for all participants  
2. Increases in number of homework trials completed per minute in choice condition for all participants | 77% PND for completed homework assignments w/ choice-making intervention 85% PND for correct homework w/ choice-making intervention |

Eleven studies were analyzed for this review, and effects of self-determination interventions on academic skills for students with MRDD were positive. There were a total 156 participants, spanning 34 years of studies. Effects were generally stronger for organization skills in academic assignments than for more traditional academic measures, such as spelling as-
assignment accuracy or math assignment productivity. Similarly, effects were stronger for productivity of both math and language arts assignments than for accuracy measures.

Multi-component self-determination and self-management interventions were the most frequently studied independent variables. Choice making, goal-setting, and self-advocacy were the only other self-determination interventions used. While this review focused on academic dependent variables, such variables represented just under half of the total number of dependent variables measured by the studies, suggesting the lack of focus on academic skills in the self-determination literature for students with MRDD. However, while the wealth of the studies reviewed were from this century, the inclusion of studies from 1971 and 1984 indicate that using self-determination as an intervention to promote academic success for this population is not a completely new idea.

In terms of self-determination components taught to individuals with MRDD, our findings differ from Algozzine et al. (2001), who found that students with mental retardation were

<table>
<thead>
<tr>
<th>Reference</th>
<th>Results for Academic Variable</th>
<th>Percent Non-Overlapping Data Points</th>
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</thead>
<tbody>
<tr>
<td>McCarl et al. (1991)</td>
<td>1. Two participants demonstrated a variable but clear increase from baseline to intervention in rate/minute digits written; one participant demonstrated an average increase of 38%</td>
<td>74% PND for math assignment productivity w/ self-management intervention</td>
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<tr>
<td></td>
<td>2. Two participants continued high rates of accuracy in intervention (no change from baseline); third participant demonstrated a clear increase in accuracy during intervention, however, was beginning increase in accuracy in baseline phase</td>
<td>11% PND for math assignment quality w/ self-management intervention</td>
</tr>
<tr>
<td>Warner &amp; deJung, (1971)</td>
<td>1. Overall mean score of participants making goal statements was greater than participants not making goal statements</td>
<td>Unable to calculate effect sizes with data provided</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference</th>
<th>Participants described</th>
<th>Setting described</th>
<th>Selection described</th>
<th>Operationally defined IV</th>
<th>Inter-rater reliability</th>
<th>Replicable IV</th>
<th>Procedural fidelity</th>
<th>Experimental control</th>
<th>Demonstration of effects</th>
<th>Socially valid</th>
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<tr>
<td>Rock (2005)</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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<td>Brooks et al. (2003)</td>
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<td>Agran et al. (2002)</td>
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<td>Hughes et al. (2002)</td>
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<td>O’Reilly et al. (2002)</td>
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<td>Czaft et al. (1998)</td>
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<td>Moes (1998)</td>
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<td>McCarl et al. (1991)</td>
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</table>
most frequently taught the self-determination component of choice-making. In this review of self-determination as a method of promoting academic skills, combined strategies of self-management, goal-setting, and problem-solving were found to be most effective and used most frequently with this population. Self-management strategies alone were also used widely with this population to promote academic skills. It is important to note that in the one study in which choice-making was used as the intervention, the results on academic productivity and accuracy were powerful. However, while traditionally associated with self-determination interventions for students with MRDD, choice-making was used alone in only one of the academic studies reviewed.

The majority of interventions used single-subject designs, primarily multiple baseline designs. Generally, the studies demonstrated attention to quality research implementation; however, particular weaknesses, such as an absence of measures of procedural fidelity and limited information on participants were noted for many studies. These same weaknesses in methodological rigor were noted in the Test et al. (2005) review of self-advocacy intervention studies and the Wood, Fowler, Uphold, & Test (2006) review of self-determination interventions with students with severe disabilities. One difference in this review was the presence of more studies that demonstrated stronger control for internal validity through use of multi-tiered multiple baseline designs.

Limitations

The first limitation of this review is the paucity of research of self-determination interventions on academic performance of this population, which limits the ability to generalize the results. Only 11 studies were located in which results for individuals with MRDD could be clearly demonstrated.

A second limitation is the lack of specific terminology regarding the components of self-determination (e.g., self-monitoring, self-evaluation, self-recruitment, self-advocacy). Because authors did not always define their interventions using the components of self-determination that we applied to this research, we cannot be certain that we always made the correct decisions in categorizing the interventions. However, inter-rater agreement indicated that we were consistent.

Third, this review focused on self-determination intervention effects on academic skills, even though this may not have been the primary purpose of the original studies. Therefore, we were applying standards such as review of study design quality and strength of effects to measurement of variables that were not always the primary variable of concern in the original study. For example, the strength of effects could not be examined for all studies because the data on the academic variables were not graphed allowing for a calculation of PND (e.g., Rock, 2005).

Finally, the results of calculations of median PNDs across studies for categories of dependent variables and components of interventions should be interpreted cautiously. Calculations of PND for specific independent and dependent variables only represented one to three studies, due to the small number of studies reviewed. Because these studies were conducted with different participants and used various measures, the PNDs reported can provide the field with a sense of the strengths in these areas, but the PND calculations for individual studies are more definitive. However, the best way to build a case for external validity using single-subject research is through systematic replication (Horner et al., 2005).

Implications for Research

There is still a need for further research on how self-determination interventions affect academic skills for students with MRDD. Particularly given that students with MRDD are expected to access the same curriculum as students without disabilities and be assessed using the same measures as their peers without disabilities in many cases. However, since research also indicates that self-determination is an important skill for enhancing an individual’s quality of life (e.g., Benz et al., 1997; Wehmeyer & Palmer, 2003), it is important to focus on interventions that help student learn both academic and self-determination skills. While the current body of literature provides a good start, further research is needed that
investigates effects on both self-determination and academic skills.

In such research there is a need to examine academic variables such as accuracy and fluency in academic assignments. In the current review, organizational skills to complete assignments and asking for assistance to complete assignments were measured more frequently than productivity or accuracy on academic content assignments. This call for investigating more traditional academic variables is not intended to undermine the importance of organizational skills; it is simply an observation that such skills were less frequently the focus of research. Further, academic skills should be a primary, not simply a collateral measure in future research on self-determination interventions. The lack of graphing of the academic variable in some studies did not allow for a visual inspection of the results, critical to the interpretation of single-subject research.

Interventions with multiple self-determination components were most effective. However, these were also typically used to measure the dependent variables categorized as “other”. It is unclear if student performance on those “other” skills were stronger than accuracy and productivity, or if the measures of less traditional academic skills were simply more sensitive. Future research should investigate the effects presented in this review with replications of studies as well as investigations of similar interventions on different academic skills.

Further, some interventions included contingencies for performance of skills (e.g., Brooks et al., 2003). Researchers need to investigate the effects of self-determination interventions with extrinsic rewards, such as praise and tangible rewards, compared to self-determination interventions that do not reward students for completing the intervention, to better understand the strength of self-determination skill development alone. Further investigation is warranted by the generally positive results of this review to support infusion of self-determination and academic instruction as a worthy and effective method of instruction for all students.

Finally, future research must attend to rigor in design. Only one study in this review measured procedural fidelity. Replication of research is strengthened by these measures. Participant descriptions should include information on ethnicity and geography as another means of enhancing replication efforts, as well as responding to the need to examine self-determination interventions for diverse populations as suggested by Test et al. (2005) and Wood et al. (2006). Single-subject studies must use rigorous designs that insure internal validity so that conclusions may be drawn from the research. Horner et al. (2005) recommend demonstration of three replications of effect through use of three-tiered multiple baseline or reversal designs with multiple replications demonstrated. Similarly, group designs need to use and describe control group conditions to strengthen their designs. Within group studies should provide pre and post test measures and account for changes that may occur over time (Gersten et al., 2005). Finally, only about one-third of the studies in this review collected maintenance, generalization, or social validity data. Such measures are critical to demonstrating the strength and value of interventions and should be included in future research of self-determination interventions.

Implications for Practice

Educators can use this emerging body of research to support teaching self-determination skills as a means to also increase performance of academic skills for students with MRDD. Therefore, self-determination does not need to be considered an “add-on,” but can be used to support attainment of academic skills. In every study, students demonstrated an increase in the performance of the measured academic skill. For educators this means two things. First, teaching self-determination does not detract from academic skill attainment, and second, when teaching self-determination it is important to measure academic outcomes. Educators may use this review as a guide for the types of interventions that have been successful.

A word of caution for educators is that self-determination interventions alone can only increase behaviors that are already in students’ repertoires. Although they may support students in learning an academic skill, they have not yet been designed to teach academic...
skills. In the studies included in this review, explicit instruction (direct instruction, modeling, explicit feedback on performance, opportunities to practice) of both the self-determination component skill and the academic skill demonstrated positive results (e.g., Agran et al., 2002; Hughes et al., 2002).

In conclusion, since self-determination is a complex construct, it will be important for researchers and practitioners to determine which components of self-determination are more closely linked to improved academic performance. The results of the current study provide initial evidence linking the self-determination components of self-management, goal setting, problem solving, decision making, choice making, self-advocacy to increased student performance on academic skills.

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(References marked with an * were included in the review.)


School-to-work components that predict postschool success for students with and without disabilities. Exceptional Children, 63, 151–165.


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